#348: Size-invariant Facial Expression Categorization and Associated Gaze Allocation within Social Interaction Space

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Introduction

- Faces often appear under very different viewing conditions and invariant facial information recognition is a key to our social interactions.
- Varying viewing angle [1] and image resolution [2] have limited impact on the recognition of common facial expressions.
- Different expressions are better suited to either close-range or distant communication [3]. Limitations: high-intensity, long-range viewing distance.

Question: How typical social distances affect recognition of facial expression with varying intensities?

- Different facial features transmit diagnostic information in recognizing different expressions [4].
- We scan all key facial features but look more at local regions that are most characteristic for each expression [5].

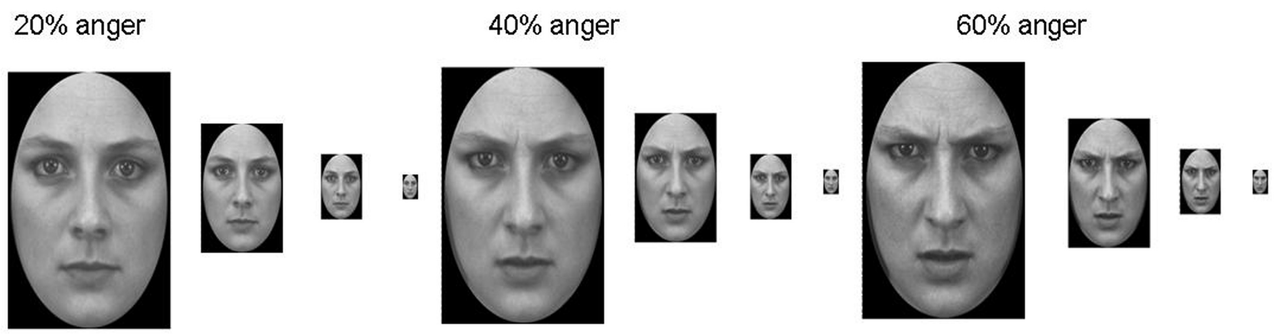
Question: How this 'holistic' but also expression-sensitive gaze pattern change with viewing distance and expression intensity?

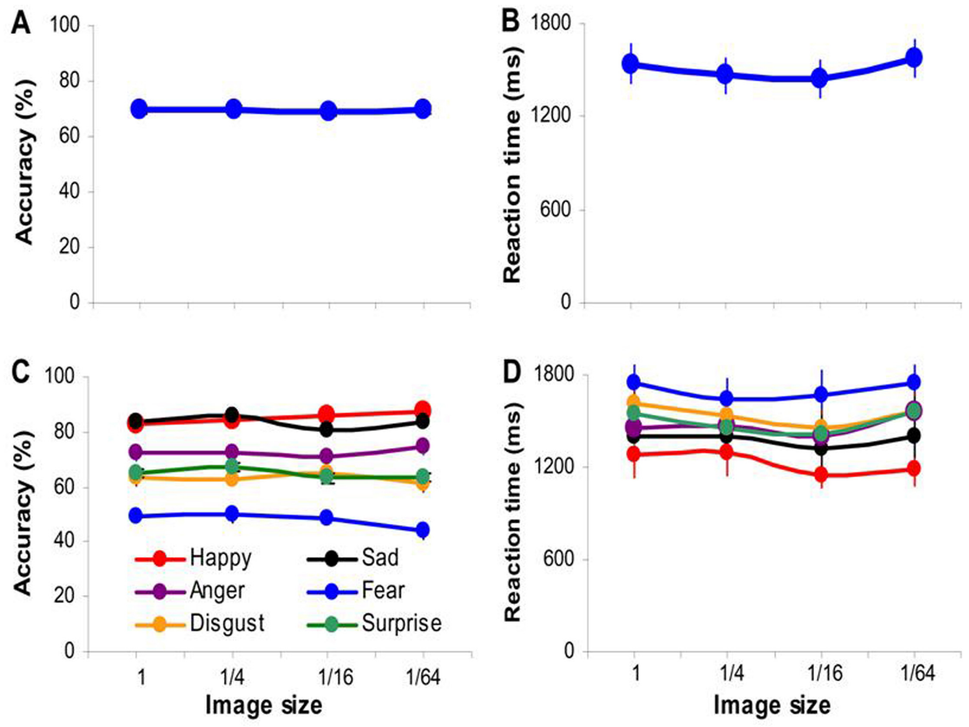
Methods

- 26 young female Caucasian participants (18-22 years old); self-paced free-viewing facial expression categorization task.
- Grey-scale face images: 6 expressions (happiness, sadness, fear, anger, disgust and surprise), 3 intensities (20%, 60%, 100%), 4 face sizes (equivalent viewing distance of 62cm, 125cm, 250cm and 500cm).

Results and Discussion

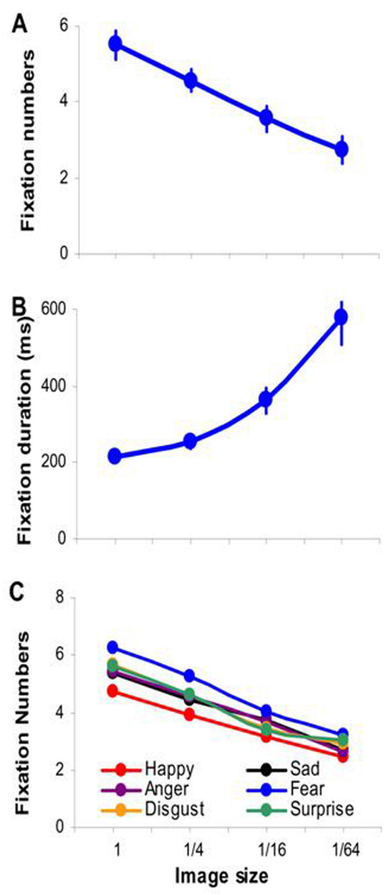
Analysis of behavioural responses in expression categorization:



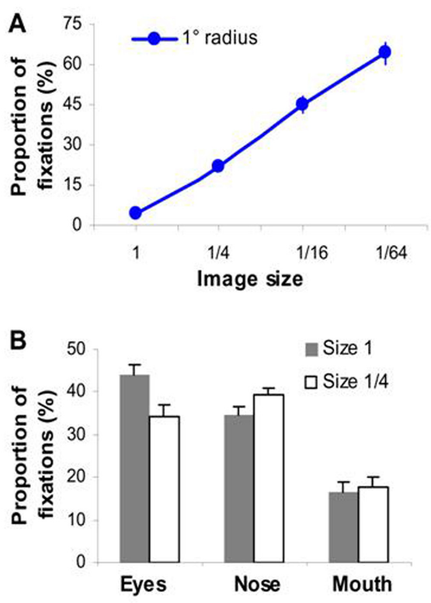


- Across the tested range of face sizes, participants showed indistinguishable categorization accuracy (A) and reaction time (B) for individual facial expression presented with varying intensities.
- Categorization performance is expression-dependent (C & D) and increases with the increasing expression intensity.

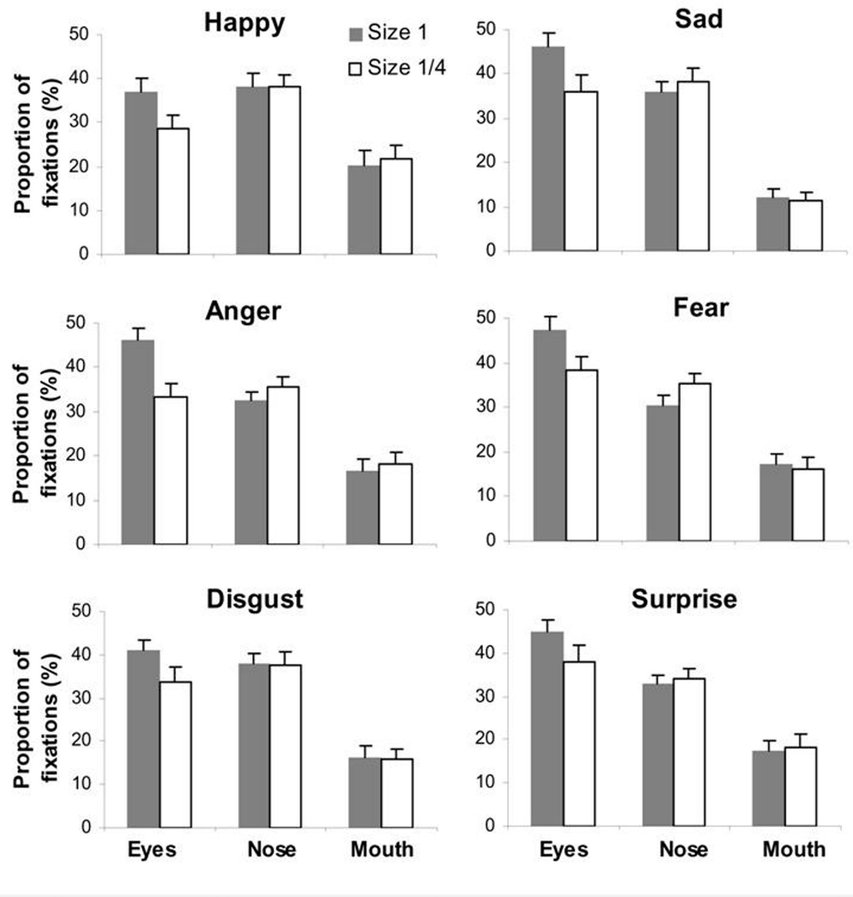
Analysis of gaze patterns in expression categorization:



Reducing face size would gradually decrease number of fixations needed to classify facial expressions (A) but gradually increase mean fixation durations (B).



Stronger central bias in the processing of smaller face images.



The expression-specific gaze allocation was largely preserved in size1 and size¼ faces. As far as the individual facial feature was big enough to attract direct fixation, participants tended to look more often at the mouth in happy faces than in other expressive faces, and at the eyes in fearful and surprised faces than in other facial expressions.

Conclusion

- When viewing expressive faces within typical social interaction range, participants showed indistinguishable categorization accuracy and reaction time regardless of the presented expressions and their intensities, suggesting a size-invariant categorization process for facial expressions of emotion.
- This size-invariant expression recognition is linked with a 'holistic' and expression-specific gaze strategy. Smaller face would attract stronger central fixation bias to efficiently gather facial cues from surrounding features. But if individual facial features were big enough to attract direction gaze, people would scan all key internal facial features but fixated more often at the local feature that is most characteristic for individual facial expression.

References

[1] Matsumoto D & Hwang HS (2011) Emotion 11:1223-1229. [2] Du S & Martinez AM (2011) Journal of Vision 11(13):24, 1-13. [3] Smith FW & Schyns PG (2009) Psychological Science 20:1202-1208. [4] Smith ML, Cottrell GW, Gosselin F & Schyns PG (2005) Psychological Science 16:184-189. [5] Guo K (2012) PLoS ONE 7(8), e42585.